THE PLANT DISEASE REPORTER

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THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey

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1950 SUMMARY OF RESULTS OF FUNGICIDE TESTS ON FRUIT AND NUT TREES

Supplement 210 continued

April 15, 1952

PLANT DISEASE REPORTER SUPPLEMENT

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THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station Beltsville, Maryland

1950 SUMMARY OF RESULTS OF FUNGICIDE TESTS ON FRUIT AND NUT TREES[1]

Compiled by
The Fungicide Committee of the American Phytopathological Society:
Sub-Committee on Testing and Results of Newer Fungicides[2]

Plant Disease Reporter
Supplement 210 continued April 15, 1952

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[1]The material contained in this part of the Supplement was not available at the time that the first part of the fungicide summary, "1950 Summary of Results of Fungicide Tests on Crops Other Than Fruit Trees", was published, March 15, 1952. P. R. M.

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1950 SUMMARY OF RESULTS OF FUNGICIDE TESTS ON FRUIT AND NUT TREES

W. D. Mills

Reports of cooperators in 21 States and in two Provinces of Canada were forwarded to the writer by Dr. J. M. Hamilton for compilation late last summer, and the preliminary results of the tabulation were reported at the 13th Annual New York State Insecticide and Fungicide Conference in Ithaca, New York, November 7, 1951. During that meeting an informal conference of the section on fungicide tests was held at which it was stated that the 1950 report would not be published. When the opportunity for publication presented itself the writer was in the middle of nine consecutive weeks of winter fruit meetings so this late date is the first opportunity to complete the job. All cooperators may be assured that no such delay in the report will occur with the 1951 data.

COOPERATORS

California: L. J. Klotz, Phytophthora brown rot and Botrytis blossom blight of citrus. G. A. Zentmyer, W. A. Thorn, L. C. Masters, avocado fruit rot.
Connecticut: Saul Rich, apple scab.
Delaware: P. L. Poulos and J. N. Heuberger, apple scab.
Georgia: J. R. Cole, pecan scab.
Illinois: Dwight Powell, apple scab.
Iowa: O. F. Hobart, sour cherry leaf spot (nursery), pear Fabraea spot (nursery).
Kansas: Erwin Abineyer, apple scab.
Maine: M. T. Hilborn, apple scab.
Maryland: M. E. Goldsworthy, J. C. Dunegan, R. A. Wilson, J. M. Gorm, peach bacteriosis. M. E. Goldsworthy, J. C. Dunegan, R. A. Wilson, J. M. Gorm, eradicant fungicides for apple scab.
Massachusetts: O. C. Boyd, apple scab.
Michigan: Walker Toenjes, apple scab.
Missouri: H. G. Swartwout, grape black rot on Herbert, Catawba, and Concord varieties, apple fire blight and fungicides, sooty blotch-apple scab eradication.
New Hampshire: M. C. Richards, apple scab.
New York: D. H. Palmiter, apple scab. A. B. Burrell, concentrate sprays.
North Carolina: C. N. Clayton, strawberry leaf spot control, apple black rot and bitter rot control.
Ohio: H. C. Young and H. E. Winter, apple scab on Rome, McIntosh, Cortland.
Oregon: J. R. Kienholz, Sclerotinia brown rot of sweet cherry, pear scab. Paul W. Miller, walnut bacteriosis.
Pennsylvania: H. W. Thurston, Jr., apple fungicides.
Virginia: A. B. Groves, apple scab.
Washington: J. R. Kienholz, powdery mildew of apple. R. Sprague, powdery mildew of apple.
Wisconsin: J. D. Moore and G. W. Keitt, apple scab, cherry leafspot.
Canada - Ontario: G. C. Chamberlain, apple scab, sweet cherry blossom blight. Nova Scotia: J. F. Hockey and R. G. Ross, apple scab.

APPLE SCAB

In the following summary of apple fungicides an attempt was made to bring together all the comparisons of protectant fungicides in which each of the listed materials had been compared with each of the others in scab control. Experiments in which the fungicides were listed in order of disease control and order of plant safety were included. Leaf scab and fruit scab data were both included where percentages were given to obtain a larger number of comparisons. The following seven fungicides or groups of protectant fungicides were used in Table 1.

305 = Cr 305, 2-hydroxy 5-chlorophenyl sulfide (Röhm and Haas)
341 = Crag 341SC and 341C, pure and impure forms of 2 heptadecyl glyoxalidine (Carbon and Carbide)
Pst = Paste sulfur, largely Magnetic 70 wet ground sulfur paste. Stauffer Chemical Company. Thylox flotation sulfur paste from several gas companies was also included.
406 = Orthocide 406, N-trichloro methyl hydrophthalimide. (California Spray Chemical Co.)
D. W. S. = dry wettable sulfur, largely micronized or other air-ground elemental sulfur.
Kol = "Kolo" materials containing Banks colloidal sulfur and elemental sulfur (Niagara

Table 1. Protectants and Apple Scab Control 1950.

	305 +=-	341 +=-	Pst +=-	406 +=-	DWS +=-	Kol +=-	Fer +=-	Total +=-	Rating
305	XXX	615	402	413	110	200	301	600	1
341	516	XXX	140	525	700	202	812	501	2
Pst	204	041	XXX	311	511	600	500	402	3
406	314	525	113	XXX	300	101	411	213	4
DWS	011	007	115	003	XXX	400	301	204	5
KOL	002	202	006	101	004	XXX	101	024	6
FER	103	218	005	114	103	101	XXX	015	7

\+ better control = equal control - poorer control

Table 2. Protectants and Fruit Russeting 1950.

	341 +=-	406 +=-	Fer +=-	Kol +=-	DWS +=-	Pst +=-	305 +=-	Total +=-	Rating
341	XXX	101	201	100	100	100	300	510	1
406	101	XXX	101	100	100	100	200	420	2
Fer	102	101	XXX	100	100	100	200	411	3
Kol	001	001	001	XXX	110	300	100	303	4
DWS	001	001	001	011	XXX	300	100	204	5
Pst	001	001	003	003	003	XXX	101	106	6
305	003	002	002	001	001	101	XXX	006	7

\+ better finish = equal finish - poorer finish

Sprayer & Duster Co.). Kolofog 100 containing Phygon and sulfur was not included.

Fer = ferbam (ferricdimethyldithiocarbamate,) largely Fermate, (DuPont de Nemours)

Protectants in Table 1 are listed in order of their control of leaf and fruit scab: + indicates the material at left in the same line gave better control than the material at the head of the column; = indicates equal or a difference of less than 1 percent in scab or tied in the order of disease control; - indicates the material at the left gave poorer control than the material heading the column. Example: follow "305" line to 2nd column headed "341". "305" gave better scab control in 6 comparisons, equal control in 1 comparison and poorer control in 5 comparisons with "341". Underlined figures under + or - heading indicate that the data in one or more experiments were treated statistically, and significant differences at .05 level or higher were found. In the three-digit column at right, headed Total, the rating of each material against the other six fungicides is shown. Following the "305" line to this column we find 600 under +, =, and - respectively, indicating that "305" was superior in scab control to the other six fungicides, giving it a rating of 1. "341" with 501 indicates that "341" was superior to five other fungicides but inferior to one, giving "341" a rating of 2. Paste sulfur with four wins and three losses was third, "406" with two wins, one tie, and three losses was fourth, dry wettable sulfur with two wins and four losses was fifth, Kolofog was sixth with two ties and four losses, while ferbam was seventh with one tie and five losses. It is recognized that this fungicide usually gives poorer control of leaf scab than fruit scab, and both were included here.

Table 3. Eradicants and Apple Scab Control 1950.

	Hg Ace +=-	Hg Lac +=-	L S +=-	Phy +=-	341 +=-	Hg 806 +=-	406 +=-	Total +=-	Rating
Acet	XXX	562	123	812	403	562	303	501	1
Lact.	265	XXX	101	420	100	343	202	321	2
L. S.	321	101	XXX	101	002	001	200	222)	
Phy	218	024	101	XXX	010	100	211	222)	3
341	304	001	200	010	XXX	101	525	222	
806	265	343	100	001	101	XXX	202	132	6
406	303	202	002	112	525	202	XXX	015	7

\+ better control = equal control - poorer control

Table 4. Eradicants and Fruit Russeting.

	406 +=-	Hg Ace +=-	Hg Lac +=-	341 +=-	Phy +=-	L X +=-	Total +=-	Rating
406	XXX	210	200	311	201	100	500	1
Acet	012	XXX	205	302	201	201	302	2
Lact	002	502	XXX	104	400	010	212	3
341	113	203	401	XXX	001	200	203	4
Phyg	102	102	004	100	XXX	100	203	4
L. S.	001	102	010	002	001	XXX	014	6

\+ better finish = equal finish - poorer finish

In Table 2 the same seven protectants are rated for the amount of fruit russeting. Many less comparisons of russeting than of scab control were available. Again the differences known to be significant are underlined. The materials causing least russet are listed first. It will be noted that Crag 341, Orthocide 406, and ferbam were the three safest materials and that no significant differences were reported between them. The CR305, which was first in scab control, caused more russeting than any of the other materials.

In a similar way eradicant fungicides are compared with each other in Table 3. Crag 341 and Orthocide 406 were included because there were some reports of their effectiveness as eradicants.

Hg Ace or Acet. refer to the phenyl mercury acetates Tag (Calif. Spray Co.) and Puratized Apple Spray (Gallowhur Chem. Co.). The powdered form of phenyl mercury acetate was not included.

Hg Lac or Lact. refer to the phenyl mercury lactate, Puratized Agricultural Spray (Gallowhur Chem. Co.).

Hg 806 or 806 refer to the mercury formamide compound known as Puratized 806 (Gallowhur Chem. Co.).

L.S. = liquid lime sulfur solution. The dry lime sulfur powder was not included here.

Phy. = Phygon XL (dichloro naphthoquinone plus magnesium sulfate) (Naugatuck Chem. Co.).

341 = Crag 341C and 341SC (Carbon & Carbide).

406 = Orthocide 406 (Calif. Spray Chem. Co.).

It will be noted that the acetate and lactate salts of phenyl mercury received the first and second ratings followed by liquid lime sulfur, Phygon, and "341" in a tie for third place. The

Table 5. Performance of new fungicides as compared with generally used protectants and eradicants for apple scab control.

Protectants		Scab Control + = -	Russet + = -
	Pst	3 1 2	0 0 1
CR	DWS	1 1 0	0 0 2
305	Kol	2 0 0	0 0 1
	Fer	2 0 2	0 0 2
	406	4 1 3	0 0 2
	2351	2 0 0	0 0 1
CR	Pst	1 0 1	- - -
2351	406	1 0 4	0 0 2
	341	1 0 3	0 1 1
	Ferm	0 0 2	0 1 0
	Pst	1 0 0	1 0 0
	DWS	3 0 0	1 0 0
TMTD	341	0 0 2	1 0 1
	Fer	0 0 1	1 0 0
	Fer	1 0 0	1 0 0
Stanofide	Pst	1 0 0	0 0 1
	341	0 0 1	0 0 1
DWS x DWS +	Urea	2 0 0	- - -
Pst x Pst +	Urea	1 0 4	- - -
Fer x Fer +	Lime	1 0 0	- - -
Eradicants			
	Phy	1 0 4	0 0 2
	Lac	3 0 1	0 0 2
CR	Ace	6 0 2	0 0 3
305	806	2 0 2	0 1 0
	2351	3 0 2	0 0 1
	406	5 2 1	0 0 3
	M-bis	0 0 4	
	Lac	1 0 1	1 0 0
CR	Ace	2 0 3	1 1 0
2351	806	1 1 2	1 0 0
	406	1 1 4	0 0 2
	341	1 0 3	0 2 0
	2351	1 0 1	1 0 1
M-bis	406	1 0 3	1 0 3
	341	2 0 0	3 4 1
	806	2 0 0	- - -
	Kolo 100	1 0 0	1 0 0
Dynacide	Phy	1 1 1	0 1 3
	Lac	0 1 2	0 1 2
	Ace	1 0 2	0 0 1
	806	0 0 1	- - -
	341	1 1 0	1 0 0
	406	- - -	0 0 1
	2351	- - -	0 1 0
	341	0 0 2	- - -
Kolofog 100	406	0 0 1	
	Ace	0 1 0	1 0 0
	Ls/60	0 0 1	1 0 0
Stanofide	LS/75	0 0 1	1 0 0
	341	0 0 1	0 0 1

protection afforded the fruit by "341" seems to account for its tie with lime sulfur and Phygon. When leaf scab alone was compared, "341" and "406" were in sixth and seventh places indicating that they are largely protectants rather than eradicants. The formamide salt of mercury, "806", was in sixth place with one win, three ties, and two losses, and Orthocide 406 was poorest in scab control in comparison with the eradicants, with one tie and five losses.

In Table 4 the same eradicants, with the exception of mercury formamide, are compared in regard to fruit russeting. Of the true eradicants, the acetate and lactate salts of mercury led, with "341" and Phygon tied behind them. The older 341C was used in about half the tests and the purified 341SC in the other half. Most of the russeting reported was with the 341C. Lime sulfur caused more russeting in the small numbers of comparisons made.

A number of new or less widely known fungicides were compared in one or more experiments. In Table 5 are listed some of these materials, in comparison first with protectants and then with eradicants. These materials were:

CR305 (bis 2 hydroxy 5 chlorophenol sulfide)
CR2351 (analogue of Cr 305)
TMTD (tetramethyl thiuram disulfide)
M-bis (manganese ethylene bis dithio carbamate)
Stanofide (?)
Kolofog 100 Sulfur 3.5% + Phygon XL 27.8%

The first three columns after the materials refer to scab control and the second three columns to fruit russeting.

SUPPLEMENTAL REPORTS ON APPLE SCAB CONTROL AND SUMMARY OF TESTS WITH OTHER HOSTS

In the following pages an attempt is made to summarize reports on the control of other fruit diseases than apple scab or to quote information and comments on apple scab fungicides not covered by Tables 1 to 4 inclusive.

APPLE SCAB

Delaware, P. L. Poulos and J. W. Heuberger. Apple scab on variety Rome. (Results published as Misc. Paper No. 103 Del. Agric. Expt. Stat. Contribution No. 27 of the Department of Plant Pathology.)

Half-strength with NuGreen or manganese ethylene bis dithiocarbamate appear promising.

Tag 331 and Puratized 806 are not effective in control of fruit scab where the basis of the schedule is protection.

Illinois, D. Powell. Apple scab on Golden Delicious, Rome Beauty, Starking.

No significant difference in fruit scab control with the ten top materials. Cr 2351 and 4.9 RLF1 (?) were significantly inferior to other treatments but superior to check. Cr 305 gave excellent scab control but caused more fruit injury than the other treatments. Puratized Apple Spray and Tag 331 caused a speckling of the fruit which was not present elsewhere. This speckling was not serious enough to eliminate the fruit from a No. 1 grade.

Maine, M. T. Hilborn, apple scab on McIntosh.

The following materials are not worth further trial: Copper dimethyl dithio carbamate (Monsanto), copper mercapto benzo thiazole, 2% tetramethylthiuram disulfide in sulfur (Niagara).

Maryland, M. C. Goldsworthy, J. C. Dunegan and R. A. Wilson. Scab on Rome, Delicious, Summer Rambo, Lowry, Stayman Winesap.

Ground spraying followed by Puratized Agricultural Spray at pink and calyx stages in heavily infected isolated orchards appears to be adequate for very effective control of both leaf and fruit scab. This program is not so effective in an orchard surrounded by non-ground-sprayed orchards. In Puratized-sprayed plots, leaf color and leaf and fruit size were superior to plots sprayed with sulfur compounds. This was especially true of the Delicious and Summer Rambo varieties and somewhat less so of Rome.

Liquid lime sulfur, Puratized B, Puratized 806, and Tag, all caused leaf injuries. It was evident that these materials influenced set, for a reduction in the number of harvested fruits was observed. Puratized B proved to be the best fungicide but to have the most deleterious effect on fruit-set. Puratized Agricultural Spray appeared safe on both leaves and fruit. The introduction of parathion or of urea to the calyx spray of Puratized Agricultural Spray did not influence the results.

Massachusetts, O. C. Boyd, Scab on McIntosh, Baldwin, Wealthy.

Order of Preference: (1) sulfur 4 lb. + ferbam 1/2 lb. with one Tag spray, (2) 341SC 1 1/2 qt., (3) 341C 1 qt.

Without the one spray of Tag, sulfur-ferbam was less effective against scab than 341 SC. No russet or other spray injury to McIntosh fruit. Baldwin fruits showed moderate to heavy russeting. All plots received 341C before bloom owing to late arrival of the 341SC.

No early mite sprays. Four mite sprays applied in sulfur-ferbam May 31, June 9, July 24, and August 14. "Although red mite was present throughout the season in the 341C and 341SC trees, at no time did it become abundant enough to justify an acaricide."

Glyoxalidine-lead-lime sprays left a smooth uniform deposit on both leaves and fruit as compared with the usual blotchy deposit of the sulfur-fermate lead mixture.

Michigan, Walter Toenjes. Scab on Spy, McIntosh, Jonathan, Red Delicious.

On Red Delicious and McIntosh wettable sulfur caused more russet than ferbam and caused foliage burn and fruit scald. Ferbam caused more russet on Jonathan than sulfur and gave dark green foliage. Poor color under spray blotches occurred when ferbam was used without spreader. Fixed copper and lime were used on Spy only. Spy tolerates copper in early and later sprays without serious russeting. In cool seasons fruits are often considerably russeted and foliage is sometimes brittle and harsh. Fixed copper gave highest yield of Spy fruit.

Missouri, H. G. Swartwout. Scab inactivation on Rome Beauty.

No sprays were applied until considerable scab was showing on fruit and foliage. Rainy weather continued. Sprays were applied June 2, 16, and 30.

Counts of Terminal Five Leaves on September 6: Percent free from scab: Tag 1/2 pint, 68; Puratized Agricultural Spray 1 pt., 64; Puratized 1 pt. + 3 lbs. sulfur, 50; Tag 1/2 pint + 3/4 lb. ferbam, 27; Puratized 1 pint + 3/4 lb. ferbam, 23; sulfur 3 lb. + ferbam 3/4 lb., 3.

Percent Scab-Free Fruit September 10: Puratized 1 pint, 81; Tag 1/2 pint, 75; Puratized 1 pint + sulfur, 59; Puratized + ferbam, 44; Tag + ferbam, 39; sulfur + ferbam, 23.

As in 1950 mercuries were more effective as eradicants when used alone. Both sulfur and ferbam reduce their efficiency, with the greatest reduction from the addition of ferbam.

New Hampshire, M. C. Richards, R. Eggert. Scab on McIntosh.

Nugreen with Phygon, Puratized Agricultural Spray, or Dynacide gave good control, but fruit russet is increased with the Phygon-Nugreen combination.

Combination of Nugreen with bentonite sulfur increases difficulty of scab control, and is a dangerous combination for grower (Kolospray 5 lbs., 1.3% Kolo spray 6 lbs + Nugreen 5 lbs., 22 percent fruit scab).

Phygon and Kolocarbamate gave excellent control of cedar rusts on McIntosh leaves and Delicious fruits.

Ohio, H. C. Young and H. F. Winter. Scab on Rome Beauty.

"Very severe test. 341C and 341SC very promising; they controlled red mite also. Control trees were total loss; defoliated in early summer."

Pennsylvania, H. W. Thurston and W. A. Chandler. Scab on Stayman.

All plots receiving sulfur in schedule were significantly lower in yield. Use of lime sulfur before bloom increased russet. The new 341SC is much safer than the old 341C at equivalent dosage and slightly inferior in scab control. It should be possible to use new 341 on most varieties in pre-bloom as well as post-bloom sprays.

Orthocide 406 is a satisfactory fungicide at 2 lb. rate, but 1 lb. is not enough. Stanofide is a promising fungicide.

Canada, British Columbia. Scab on McIntosh and Delicious.

No disease data.

Foliage burn and slight fruit russeting occurred with lime sulfur. No injury occurred with: ferbam-wettable sulfur 1 lb. 3-6-100, Crag 341C 1 qt. per 100 gallons in calyx and 1 pint/100 in covers, Venturicide (organo mercury precipitated on China clay) 3 lb. per 100 gallons.

Canada, Nova Scotia, J. F. Hockey and R. G. Ross. Scab on Gravenstein, McIntosh, Cortland, Golden Delicious.

On Gravenstein, 341C, 341SC, Phygon XL and Mag 70 paste all gave good control of fruit scab; least with 341C 1 qt. and 1 pint and Phygon XL 1 lb.

On McIntosh, 1 lb. Phygon XL gave better fruit scab control than 341C 1 qt. and 1 pint in covers.

On Cortland and Golden Delicious 341C gave better fruit scab control than 341SC, four sprays each between bordeaux in delayed dormant and third cover sprays.

After rain sprays only.

Rating in scab control on McIntosh (1) Phy-

gon 1 lb., (2) lime sulfur 1-40, (3) Tag 1/2 pt., Puratized Apple 1/2 pt.

Rating on Wagener (1) Phygon 1 lb., (2) Tag 1/2 pt., (3) Puratized Apple 1/2 pt., lime sulfur 1-40 (foliage injury).

Canada, Ontario, G. C. Chamberlain. Scab on McIntosh.

Overall preference: (1) Tag 1/2 pint, sulfur covers. (2) Tag 1/2 pint, ferbam cover; Tag 1/4 pt. + sulfur 4 lb. (3) Crag 341C 1 qt. + 1/2 lb. lime; Crag 341SC 1 1/2 qt. + 1/2 lb. lime; Orthocide 406 2 lb.; Orthocide 2 lbs., ferbam covers; Orthocide 2 lbs., sulfur covers. (4) Crag 341SC, ferbam covers. (5) Phygon 1 lb. + Mg SO_4 1/2 lb., ferbam covers; Phygon 1/2 lb. + ferbam 1 lb. (6) Microfine sulfur 8 and 6 lb.; Mag. 70 paste 9 and 7 lb. (7) Kolofog "100" 4 1/2 lb. (Phygon 3.5%, sulfur 27.8%).

Some foliar mottling with Phygon. "On sweet cherries sulfur, Tag, Orthocide, and Phygon as pre-blossom sprays had no value in preventing an outbreak of blossom blight which occurred with several nights of fog in the latter part of the bloom period."

OTHER APPLE DISEASES

(See also note on cedar rust in New Hampshire scab report above)

Missouri, H. G. Swartwout. Fire blight on Jonathan and Golden Delicious.

Two bloom sprays of 1 1/2-4 1/2-100 bordeaux caused considerable russet on Golden Delicious and moderate russet on Jonathan and Winesap. Bioquin 1 at 1/2 lb., Dithane Z-78 at 2 lb. with 1 oz. Triton B1956, and Kolofog 100 at 3 1/2 lb.-100, caused no russet. Bioquin and Kolofog 100 failed to control blight. Only a trace of blight developed where the bordeaux and Dithane were applied, even on checks.

Missouri, H. G. Swartwout. Fruit finish on Golden Delicious and Jonathan.

Jonathan Rated in Order of Best Finish: (1) sulfur-lead arsenate, (2) sulfur-toxaphene, (3) sulfur-DDT, (4) sulfur-methoxychlor, (5) ferbam-toxaphene, (6) ferbam-parathion, (7) sulfur-parathion. Least russet and best finish was with lead arsenate. Nu zinc as a safener for lead arsenate caused appreciable russeting. Little difference appeared between other combinations.

Golden Delicious: Lead arsenate treatments had the least russet. Methoxychlor caused the most russet. It was severe. As in 1948 and 1949, DDT caused more russet than lead arsenate on Delicious. As with Jonathan, Nu zinc is not a safe corrective for lead arsenate. Ferbam-toxaphene and ferbam-parathion caused considerably more russet than in nearby lead-arsenate sprayed plots. Sulfur-parathion caused more and ferbam-parathion less russeting than was expected. Data indicate that activated charcoal may be effective in reducing russet from parathion, but "are far from conclusive." As in previous two years all synthetic organic insecticides caused more fruit injury than sulfur lead arsenate or a lead arsenate-ferbam combination.

Missouri, H. G. Swartwout. Sooty blotch on Golden Delicious.

Order of Sooty Blotch Control: (1) ferbam 1 lb., ferbam 3/4 lb., bordeaux 1-2-100, DN111 1 lb. (2) Karathane 1 lb. (3) Phygon XL 1/4 lb., Bioquin 1 1/4 lb.

Ferbam at 1-100 left undesirable residue on the fruit even with frequent rains during the summer. At 3/4 pound there was less but still noticeable black residue. DN111 and Karathane left little residue, and there was practically none from Bioquin or Phygon. Bordeaux caused heavy defoliation and some increase in russet. Loss of foliage from bordeaux may have been caused by a greater development of sooty blotch. There was more sooty blotch in sprayed trees on fruit in tops of trees and ends of branches than in interior, indicating some control through redistribution.

North Carolina, C. N. Clayton and J. F. Fulkerson. Bitter rot and black rot on Stayman and Golden Delicious.

No scab occurred even on checks. Bordeaux mixture controlled bitter rot and black rot best. Orthocide 406 gave very good control of black rot and fair control of bitter rot. Ferbam was relatively effective against bitter rot but ineffective in control of black rot.

Kolofog 100 (Phygon-sulfur) was totally ineffective against both rots.

Cop-o-Zink and Cr 305 were not very effective. Phygon 3/4 lbs. gave fairly good control of both rots but was ineffective at lower dosages. Cr 305 caused most russet. No Phygon delayed fruit in ripening. Stayman fruit sprayed with 303 or ferbam cracked more than with other treatments. Relatively little cracking resulted when sprayed with bordeaux or Phygon.

Orthocide-sprayed fruits were smoother. Orthocide and 341SC left no visible residue and very good color resulted. Ferbam- and Phygon-sprayed fruits were poorly colored.

"Kolofog 100 and CR305 will not be retested."

Washington, R. Sprague. Powdery mildew on Jonathan.

Karathane looked good as summer spray but has been dropped by the manufacturer.

5379 (Carbon & Carbide) shows promise and was found to be more effective than 5400 (Carbon & Carbide). Our recommendations for mildew control are; lime sulfur 2.5% pink, 2% calyx, 4 lbs. wettable sulfur in about two weeks. Mike sulfur is effective at 2 lbs. None are safe at Wenatchee after late May. Ferbam, Orthocide, and ziram are not effective.

West Virginia, C. F. Taylor. Brooks' Spot.

In the Brooks' spot test "All of the copper formulations caused excessive foliage injury. Omitting the lime gave injury in about one week, adding it delayed injury about three weeks but eventually reached about the same amount of damage. There was no perceptible difference between the bordeaux formulations and the fixed coppers and dosage had no effect."

Wisconsin, J. Duain Moore and C. W. Keitt. Russet on McIntosh.

A russet associated with the calyx end of the apple was found to be of more importance than the usual kind. This russet occurred on all plots that had received any ferbam. The most was found on plots that had been sprayed with only ferbam as the fungicide and on those plots that had received lime sulfur before bloom and ferbam after bloom. The least leaf injuries occurred on trees that had been sprayed with an organic mercury ferbam combination schedule, with ferbam only, or with the paste sulfur in all applications. There is increasing evidence that the use of certain of the milder fungicides is resulting in more annual bearing and higher yields. The general acceptance of the ground spray in the Peninsular area has made the use of milder tree spray fungicides possible.

PEAR SCAB

Oregon, J. R. Kienholz. Scab on Bartlett and Anjou.

No scab developed. Phygon XL was less safe than ferbam, Karathane, 406, or Parzate and zinc.

PEACH BACTERIAL SPOT

New Jersey, M. C. Goldsworthy, J. C. Dunegan, R. A. Wilson, M. Horn. Bacterial spot on Sun High peach.

CR305 and Compound 30* gave beautiful fruit finish and best foliage. Zinc lime caused considerable leaf injury and leaf drop.

Order of Control: (1) CR305; (2) Orthocide 406 at 3 lbs., Compound 30; (3) CR2351 at 2 lbs., 406 at 4 lbs., Zinc lime 8-8-100; (4) wettable sulfur 6 lbs.; (5) clorox 5.5% solution 3 gallons.

*Compound 30 = hydroxychloro phenyl sulfide (Sundar Corp.)

CHERRY DISEASES

Iowa, O. F. Hobart, Jr. Montmorency cherry leaf spot, in nursery. "Started late" (eradication needed).

Order of Preference: (1) 8-8-100 bordeaux, tribasic copper; (2) Phygon, Puratized; (3) 341C, 341SC; (4) 406; (5) Sulfuron, lime sulfur.

Wisconsin, J. D. Moore and G. W. Keitt. Cherry leaf spot.

Standard spray schedule consisted of 6-8-100 bordeaux mixture at petal fall, two additional sprays of 3-4-100 bordeaux mixture before harvest, and one spray after harvest. The other 13 spray programs tested gave larger fruits, in 11 significantly larger. The largest cherries were from trees receiving seasonal schedules of Dithane, Fermate, 341B, 341SC, and Tennessee 34, with either Dowax or Orthex. The group with smallest fruits received complete programs of bordeaux mixture. The intermediate size group received the full schedule of "insoluble" copper, or mixed programs of bordeaux and "insoluble" copper or bordeaux and organic materials. There were no significant differences in weight of pits, but the pulp weights were significantly different.

Studies of can corrosion started in 1949 were continued in 1950. The first examination of 1950 gave results almost identical with 1949. Except for fruit sprayed with a combination of Tennessee 34 and Dowax, the highest drained weights and highest sugars (Brix test) were from cherries that received only copper fungicides. Highest drained weights and sugars correlated well with smallest fruit sizes. In general the lowest drained weights and lowest sugars were obtained from cherries sprayed only with an organic fungicide. In both 1949 and 1950 the lowest drained weights and the lowest sugar tests were with fruit sprayed with Tennessee 34-Dowax throughout the season.

The fourth cutting of the 1949 pack, made in August and September 1950, showed corrosion ranging from very slight to moderately heavy. The type of corrosion could not be correlated too closely with the fungicide used and the results of this work are not conclusive. There was an indication, however, that the least corrosion was present in cans used to process fruits from plots that had been sprayed with a glyoxalidine material.

There was a marked difference in the color of fruit from the fourth cutting. Fruit sprayed with bordeaux in the first spray and 341B in the other two pre-harvest sprays had the poorest color. Fruit sprayed with the standard bordeaux and with the Tennessee 34-Dowax combination also averaged poor in color. There was little difference among the other programs in fruit color.

The various fungicides were continued in the spray after harvest rather than the usual bordeaux post-harvest spray.

Counts September 5, when leaf spot was abundant only on checks, showed least leaf drop on plots receiving three sprays of ferbam and most on plots receiving three sprays of bordeaux mixture. The least defoliation and the most defoliation on October 11 was on the same two plots. In general, greatest defoliation due to spray injury occurred with seasonal spray schedules of bordeaux mixture, and least on plots receiving full schedules of an organic fungicide, with intermediate amounts on the mixed programs. The "insoluble" copper COCS ranked with the organic in defoliation due to spray injury.

Oregon, J. R. Kienholz. Brown rot on sweet cherry.

Equally safe on Bing and Lambert cherries were: Puratized Agricultural spray, Phygon XL 1/2 lb., Ferbam 1 1/2 lbs., Orthocide 406 2 lbs., Karathane 1 lb., and Sulfuron 6 lbs. per 100 gallons. No brown rot data were obtained.

(See also note on sweet cherry blossom blight in Ontario report on apple scab above)

GRAPE BLACK ROT

Missouri, H. G. Swartwout. Black rot on Concord, Herbert, and Catawba grapes.

Bordeaux, ferbam, Bioquin, and Orthocide controlled black rot in Concord grapes. Fair control and light injury was obtained with Dithane D-14 + 1 lb. $ZnSO_4$ (36%). A trace of injury resulted from other materials.

In test with Herbert and Catawba grapes, ferbam 1 1/2 pounds + Tennessee 26 was superior in control to Bioquin at 1 1/2 pound per 100 gallons.

STRAWBERRY LEAF SPOT

Missouri, H. G. Swartwout.

Two sprays: (1) when flower buds could be seen, (2) when first blossoms open. At least three pre-bloom sprays should have been made.

Ratings after harvest: Actidione* 20 p.p.m., good control, best of all treatments. Dithane D-14 + 1 lb. zinc sulfate fair control, second to Actidione. Bioquin 1, 1/2 lb. + 1 oz. Triton B1956, fair control, not quite the equal of Dithane. Bordeaux 4-6-100, slight control, very little better than checks. Ferbam 2-100, no control.

Ratings mid-October: (1) Actidione good control; (2) Bioquin moderate control; (3) Dithane, Bordeaux, slight control; (5) ferbam no control.

*Actidione is the registered trade mark for the antibiotic b3-(2-(3.5-dimethyl-2-oxocyclohexyl)-2-hydroxyethyl)-glutarimide. (UpJohn Co., Kalamazoo, Mich.)

North Carolina, C. E. Lewis and C. N. Clayton.

Most effective control and most injury occurred with higher dosages of bordeaux mixture. Phygon XL + U.S. Rubber Co. fungicide sticker gave good control and no injury. Orthocide 406, CR 305, and 341SC were ineffective against leaf spot.

CITRUS

California, L. J. Klotz, E. C. Calavan, E. L. Wambler, T. A. DeWolfe. Phytophthora brown rot and Botrytis blossom blight on lemon.

Order of Phytophthora Control: (1) Zinc Coposil 3 lbs. (2) 1-1-100 bordeaux, Dithane D-14 + $FeSO_4$ + oil + SS3 8-0.8-8-0.37. (3) Crag 640 2 lbs. (4) 20-4 Fungorex + Citroflo oil + S20 spreader 8-2-0.37. (5) Crag 658. (6) Copper A + SS3 Spreader Sticker 1.5-0.125. (7) Crag 658 + SS3 2-0.06. (8) Alcufe + Citroflo oil + S20 5-2-0.37. (9) Crag 351 + SS3. (10) Crag 531 2 lbs. (11) Crag 169.

Order of Botrytis Control (Insufficient data): (1) ?Dithane. (2) ? 658, (3) ? Alcufe. (4) ? 531.

Order of Plant Safety: (1) 351, 531; (2) 169; (3) Fungorex; (4) 658 + SS3; (5) Alcufe; (6) 658; (7) Zinc Coposil; (8) 640; (9) bordeaux mixture.

NUT TREES

Georgia, J. R. Cole. Scab on pecan, variety Schley.

Materials in Order of Yield in Pounds per Tree: (1) Bordeaux 4-1-100 prepollination, 6-2-100 post pollination 70 lbs., (2) bordeaux 4-1-100 prepollination, ziram (5x concentration) 26 lbs., (3) Dithane Z-78 35 lbs.; (6) Vancide 30 lbs. (7) Check 20 lbs. Dithane Z-78 promising, low yields were due to light crop of nuts set. Ziram concentrate in Bean 17 mist machine does not look encouraging.

Oregon, P. W. Miller. Walnut bacteriosis.

Bordeaux mixture 4-2-100 was safer and more effective than Yellow Cuprocide (yellow cuprous oxide, Röhm & Haas Co.) or Copper A Compound (copper oxychloride, Dupont) which are not worth further trial.